



(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:  
**08.07.2015 Bulletin 2015/28**

(51) Int Cl.:  
**H01L 51/50<sup>(2006.01)</sup> H01L 51/54<sup>(2006.01)</sup>**

(43) Date of publication A2:  
**20.05.2015 Bulletin 2015/21**

(21) Application number: **14003750.8**

(22) Date of filing: **06.11.2014**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA ME**

(30) Priority: **15.11.2013 US 201361904530 P**  
**22.11.2013 US 201361907450 P**  
**22.10.2014 US 201414521257**  
**22.10.2014 US 201414521281**

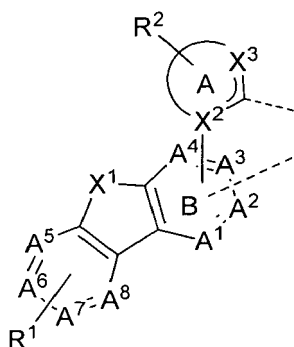
(71) Applicant: **Universal Display Corporation**  
**Ewing, NJ 08618 (US)**

(72) Inventors:  
• **Xia, Chuanjun**  
**Ewing, NJ New Jersey 08618 (US)**  
• **Lin, Chun**  
**Ewing, NJ New Jersey 08618 (US)**  
• **Kottas, Gregory**  
**Ewing, NJ New Jersey 08618 (US)**  
• **Elshenawy, Zeinab**  
**Ewing, NJ New Jersey 08618 (US)**

(74) Representative: **Braun, Nils**  
**Maiwald Patentanwalts GmbH**  
**Elisenhof**  
**Elisenstraße 3**  
**80335 München (DE)**

(54) **Organic electroluminescent materials and devices**

(57) According to one embodiment, a compound comprising a ligand  $L_A$  of Formula I



$L_A$  is coordinated to a metal M; and the ligand  $L_A$  is optionally linked with other ligands to comprise up to a hexadentate ligand. Formulations and devices, such as an OLEDs, that include the compound comprising ligand  $L_A$  of formula I are also described.

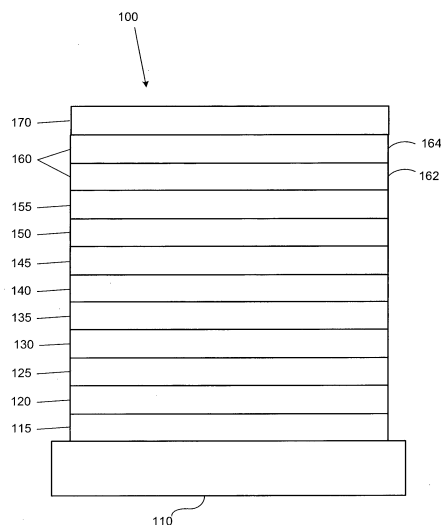


FIGURE 1



## EUROPEAN SEARCH REPORT

Application Number  
EP 14 00 3750

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,P	US 8 692 241 B1 (ZENG LICHANG [US] ET AL) 8 April 2014 (2014-04-08) * columns 3-26; figure 1; compounds 31,35,41 * * columns 30-82; claims 1-22 *	1-4,14,15	INV. H01L51/50 H01L51/54
X	DE 10 2004 057072 A1 (BASF AG [DE]) 1 June 2006 (2006-06-01) * paragraphs [0077] - [0079], [0136]; claims 1-12 *	1,3,14,15	
A	* paragraphs [0149] - [0157] *	2,4-13	
X	WO 2012/170461 A1 (UNIVERSAL DISPLAY CORP [US]; LIN CHUN [US]; XIA CHUANJUN [US]; TSAI JU) 13 December 2012 (2012-12-13) * paragraphs [0040] - [0088]; claims 1-33; figures 1-3 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01L
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 May 2015	Examiner Konrádsson, Ásgeir
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 00 3750

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

28-05-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 8692241 B1	08-04-2014	NONE	
DE 102004057072 A1	01-06-2006	AT 435867 T	15-07-2009
		CN 101065389 A	31-10-2007
		DE 102004057072 A1	01-06-2006
		EP 1819717 A2	22-08-2007
		JP 5001851 B2	15-08-2012
		JP 2008521946 A	26-06-2008
		KR 20070090953 A	06-09-2007
		US 2008018221 A1	24-01-2008
		US 2014309428 A1	16-10-2014
		WO 2006056418 A2	01-06-2006
WO 2012170461 A1	13-12-2012	CN 103596967 A	19-02-2014
		EP 2718302 A1	16-04-2014
		JP 2014517007 A	17-07-2014
		JP 2014517009 A	17-07-2014
		JP 2014523410 A	11-09-2014
		KR 20140041550 A	04-04-2014
		KR 20140041551 A	04-04-2014
		KR 20140041552 A	04-04-2014
		TW 201302765 A	16-01-2013
		TW 201302766 A	16-01-2013
		TW 201307360 A	16-02-2013
		US 2014110691 A1	24-04-2014
		US 2014131687 A1	15-05-2014
		US 2014175408 A1	26-06-2014
		WO 2012170461 A1	13-12-2012
		WO 2012170463 A1	13-12-2012
		WO 2012170571 A1	13-12-2012